**CHALLENGER FIELD TRIP BACKGROUND INFORMATION**

**Capturing Dust**

Often in their careers, scientists must find creative solutions in order to accomplish their research. For instance, how can you collect fast-moving dust particles WITHOUT causing them to change shape when they hit the collecting device? The solution to this problem was the key to the Stardust Mission; a spacecraft that would fly to a comet and collect particles from its coma and tail.

In order to make an effective collecting device, scientists had to know the properties of this comet dust. Would a huge net work? Well the particles are smaller than grains of sand and would slip right through. How about something like sticky fly paper? The problem there is that their impact velocity can be up to 6 times the speed of a bullet fired from a rifle. They would tear right through the fly paper.

High speed capture could alter their shape and chemical composition or vaporize them entirely. Scientists needed something that would capture these very tiny delicate particles without damaging them. The collecting device also had to be strong enough to survive the launch into space, lightweight to keep liftoff costs low and be composed of materials that couldn’t melt or freeze in the extreme temperatures of space. Finally, the device needed to allow scientists to find the captured particles easily.

Aerogel, is a man-made, silicon based substance that is proving itself very useful to space scientists. It is 1000 times less dense that glass because it is made of 99% air. Despite its very low weight, Aerogel is very strong and is able to withstand the jostling of lift-off and the extreme conditions of space. Not only that, but Aerogel is a very effective insulator. One inch of Aerogel has the insulating power of 6 inches of fiberglass. For this and many other reasons, Aerogel has been used on previous space missions, including the Mars Pathfinder.

In the Stardust mission, when a dust particle hits Aerogel, it buries itself in the material, creating a carrot-shaped track as it comes to a stop. Because Aerogel is almost completely transparent, it is relatively easy to find these tracks and locate the particles at the tip of the “carrot”.

**The Visible Spectrum**

Many things in space are too far away for humans to visit so scientists have to be clever in order to learn more about them. One way to do this is by studying the visible light that comes from these objects. Although we cannot see it, visible light comes in tiny waves. Not all the waves are the same size; some are shorter and some are longer. We see these different wavelengths as colors.

Sunlight is made up of the colors red, orange, yellow, green, blue and violet. When sunlight passes through a diffraction grating, like rain or a prism, you can see each of these colors. This is called the visible spectrum. The size of each colors’ section of the spectrum can tell you what kind of light you are looking at. Different types of light, like neon or fluorescent light, have a different spectrum because they are made from different elements. Some colors might be missing or have bigger or smaller sections in the spectrum. Things in space like stars, galaxies and COMETS are each composed of different elements so by “reading” their spectra, we can find out what they are made of.

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**CHALLENGER FIELD TRIP BACKGROUND INFORMATION QUESTIONS - HONORS**

Complete the analogies below.

1. Stardust is like a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

because they both\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Aerogel is like a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. The visible spectra is like a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Aerogel has very special and unique qualities. As you know, Aerogel was used to capture comet dust. Use your imagination, what would be another use for Aerogel and why would Aerogel be well-suited for that job??

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1. Go on-line and look up the spectra of carbon and oxygen. Compare the two. How are they the same? How are they different?

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1. Based on the spectra of carbon and oxygen, what would you predict the spectrum of carbon dioxide (CO2) would be? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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